

Patent Application for: Varying Refractive Index Optical Medium Using  
at Least Two Materials with Thicknesses Less than a Wavelength

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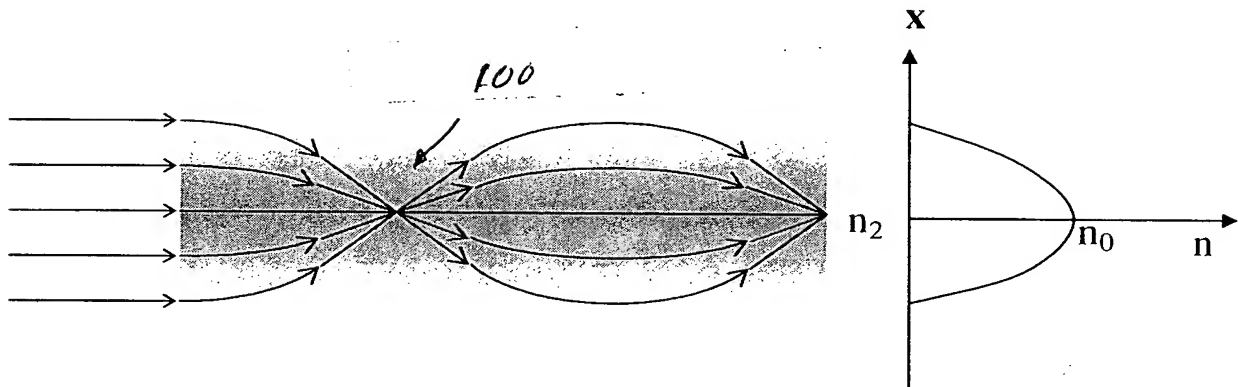


Fig. 1

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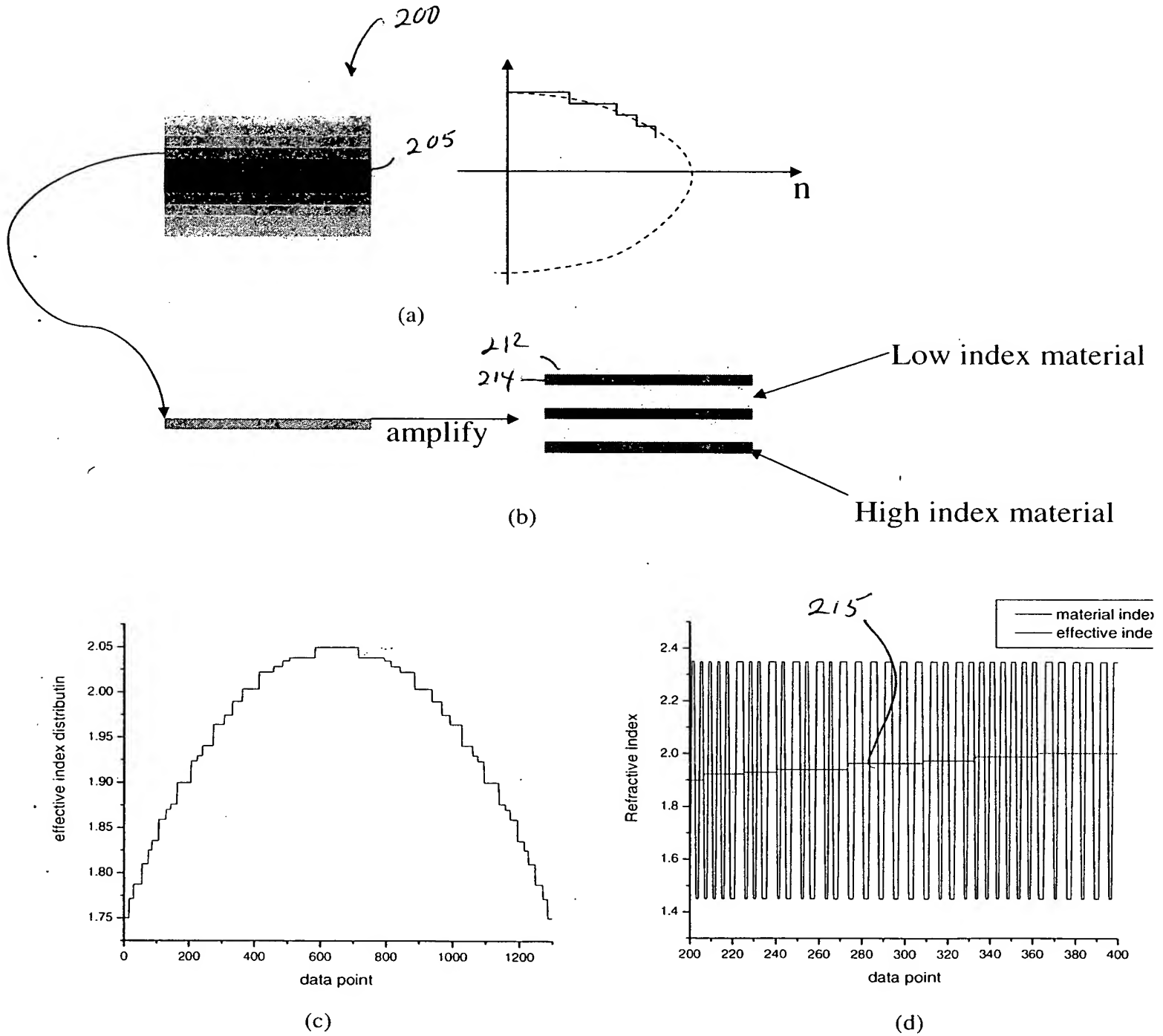
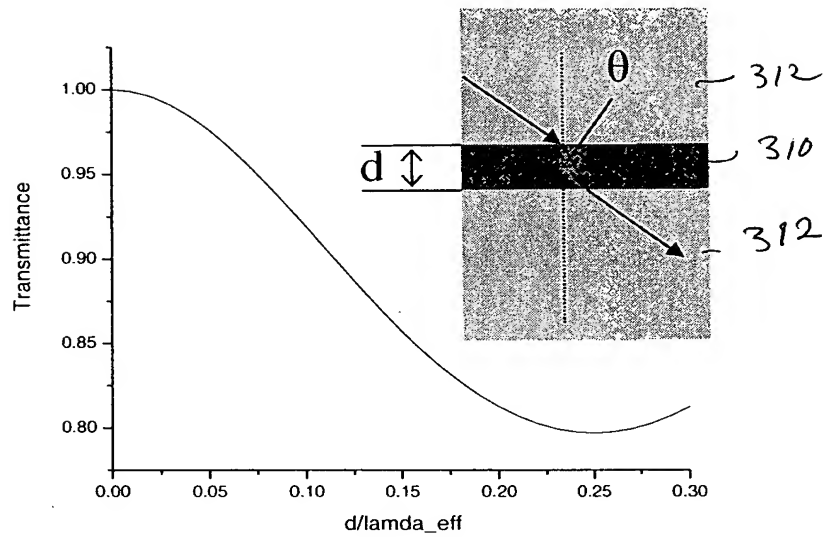


FIG. 2

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Relationship of transmittance vs  $d/\lambda_{eff}$

FIG. 3

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Multiple-step-index case

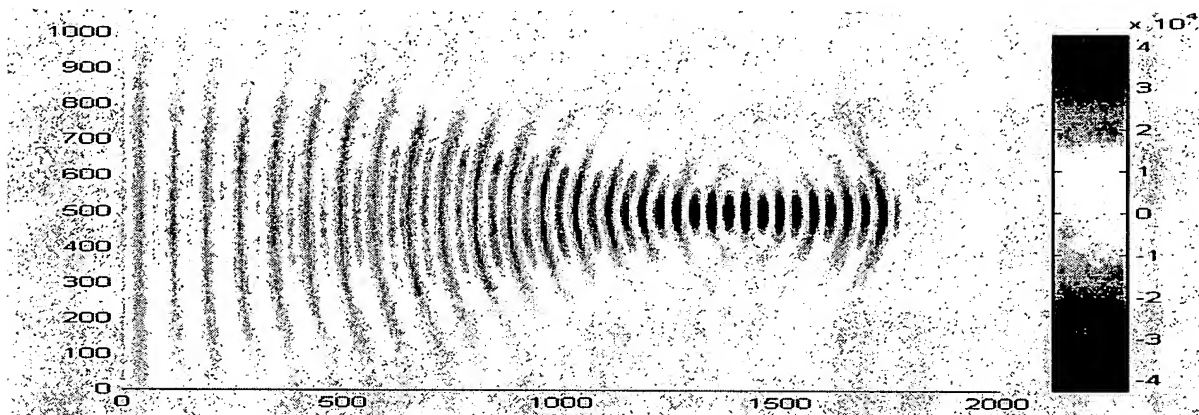


FIG. 4A

Two-material case

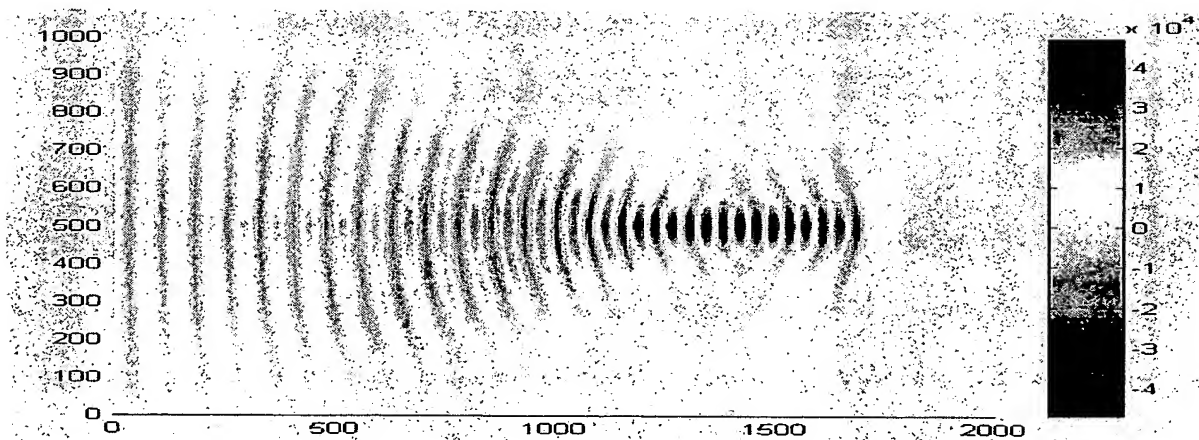


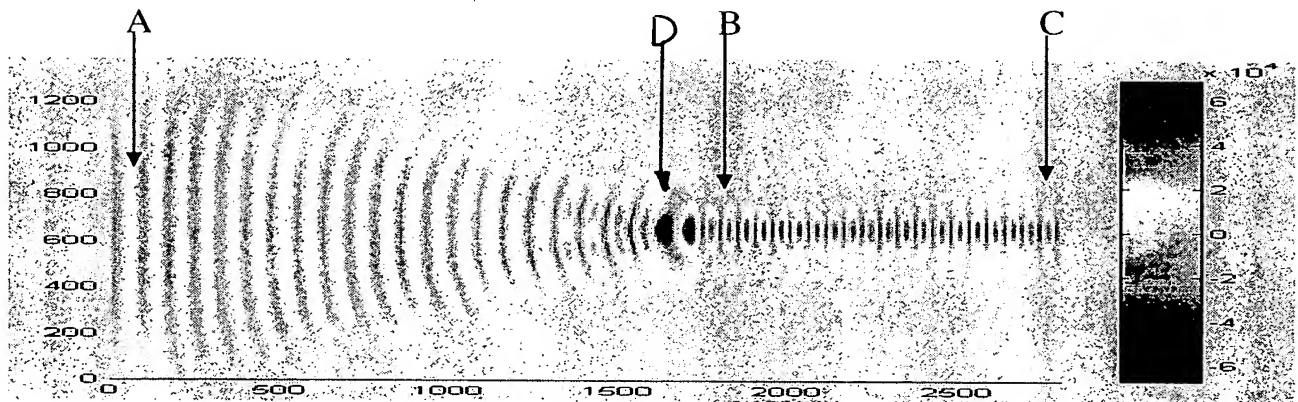
FIG. 4B

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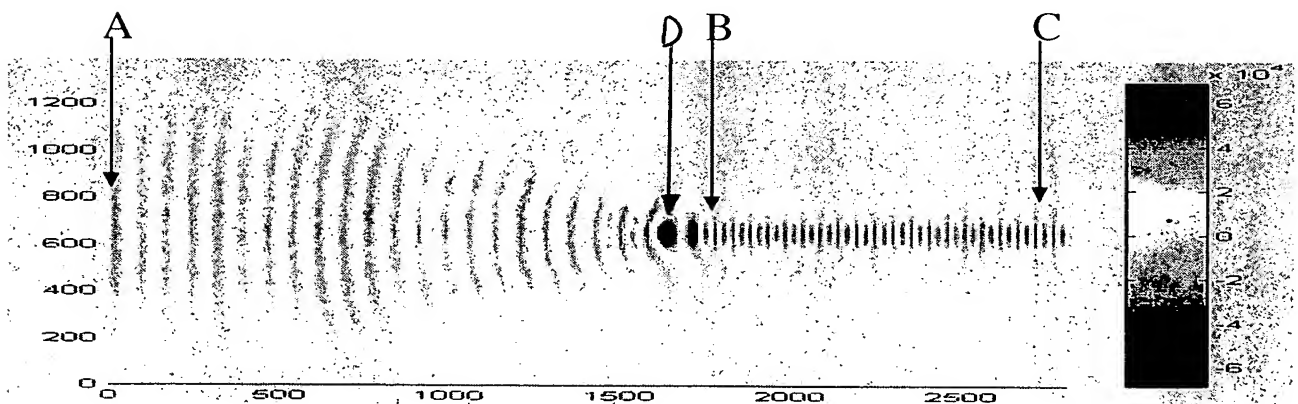
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Table 1 Comparison of loss of light energy between two-material case  
and multiple-step-index case

	Two material case	Multiple step index case
Amount of light energy passed through the GRIN lens from A to B	99.9 %	99.8 %
Amount of light energy passed from B to C (including mode matching)	99.7 %	99.5 %
Amount of light energy within the actually InP waveguide at C over the total energy at C	95.6 %	98.2 %
Overall theoretical coupling efficiency	95.3 %	97.7 %



(a) Two Material Case, with AR coatings, 1  $\mu\text{m}$  air gap, focusing in air



(b) Multiple step index case, 1  $\mu\text{m}$  air gap, AR coatings, focusing in air

FIG. 5

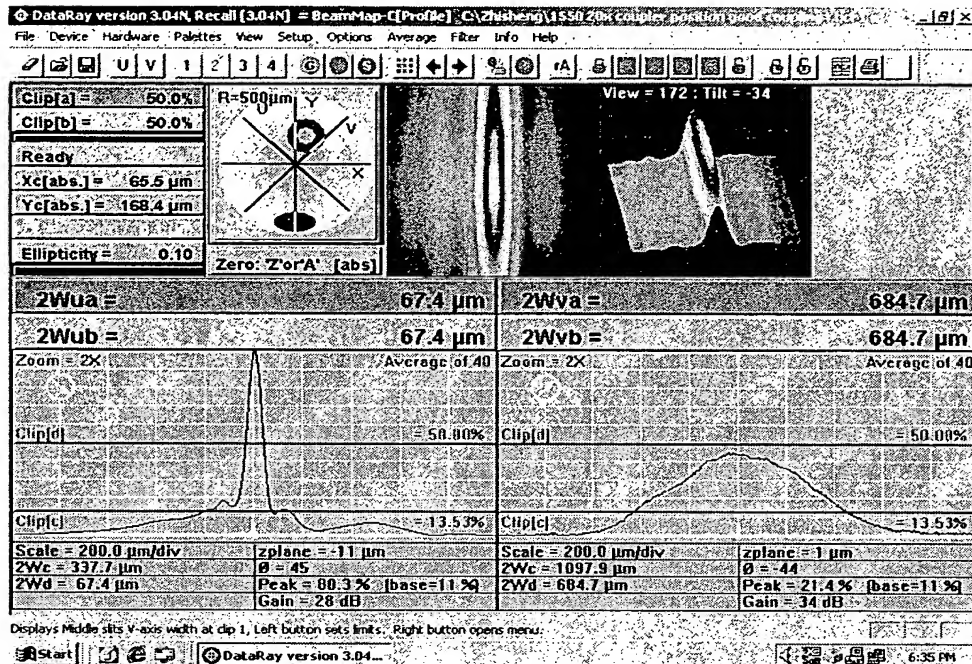
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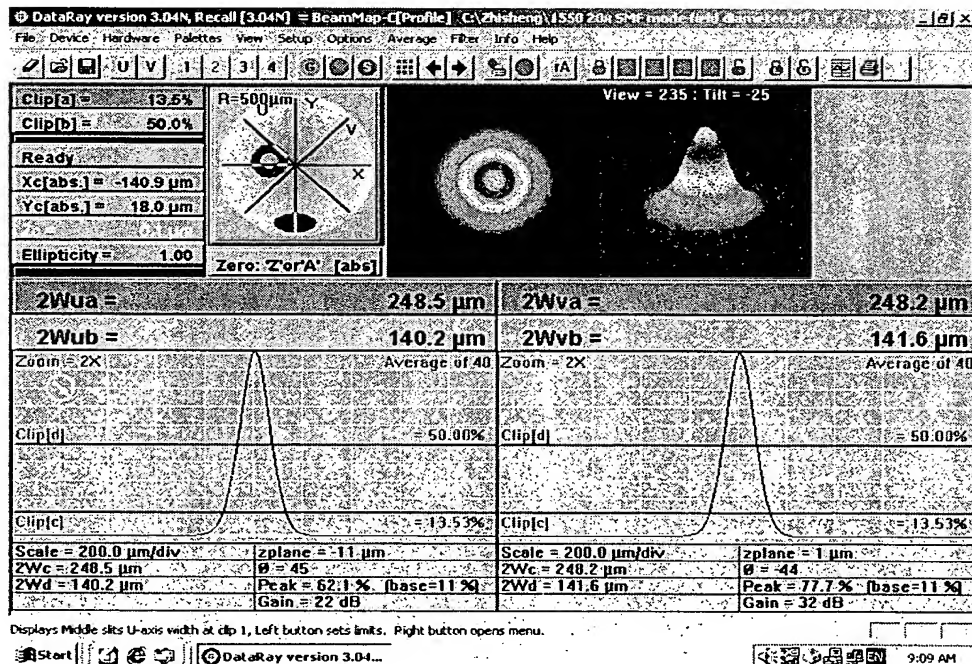
FIG. 6

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(a)



(b)

FIG. 7

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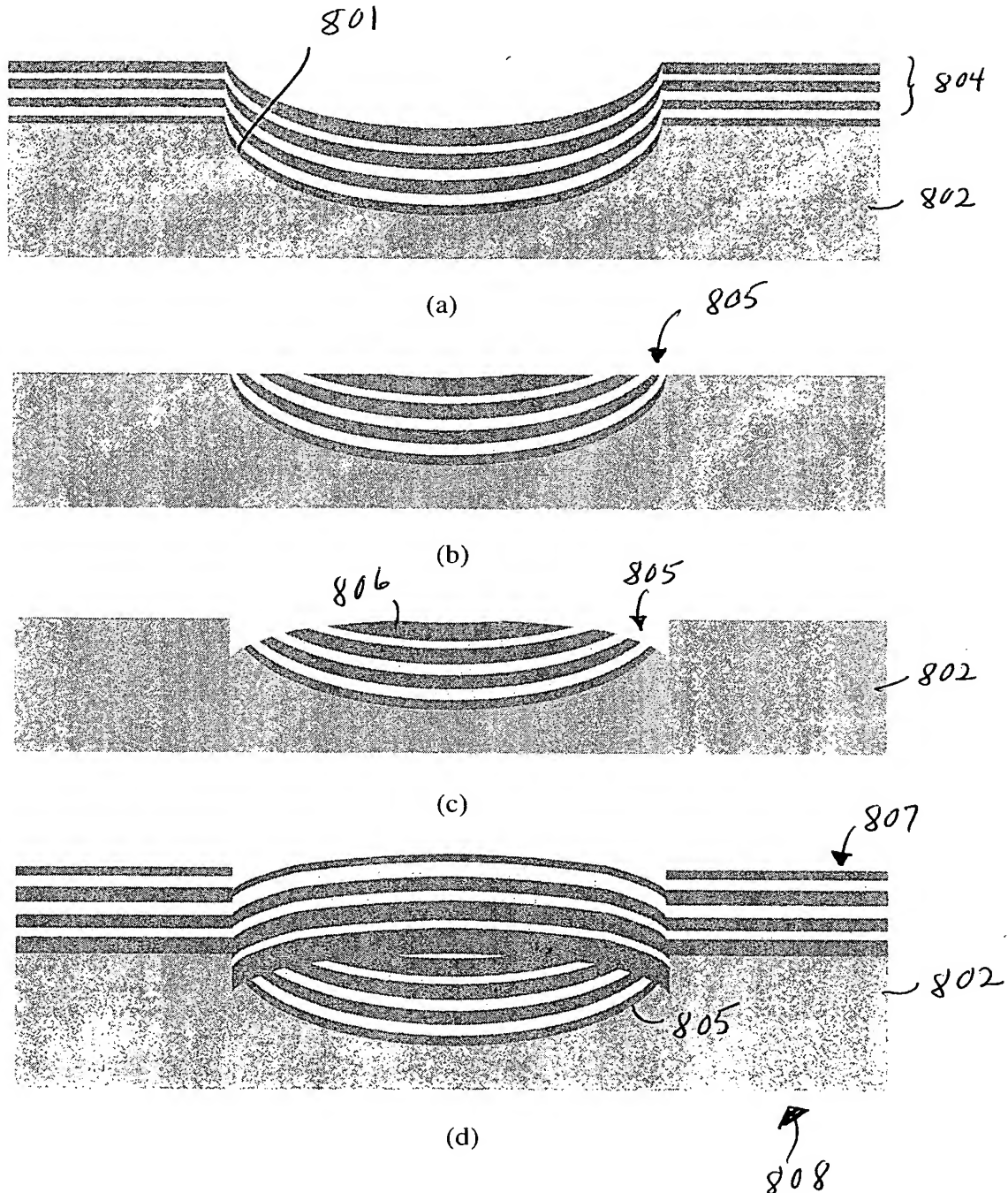


FIG. 8

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